

construed them as the constituents of ordinary substances. Crucially, Shapere drew attention to the fact that scientists' reasons for grouping items together into a common domain may change over time. Moreover, as Toulmin noted, an item may be grouped with different items into different domains depending on the questions asked, and different investigators may ask different questions:

If we mark sciences off from one another (using Shapere's term) by their respective 'domains', even these 'domains' have to be identified, not by the types of objects with which they deal, but rather by the questions which arise about them. Any particular type of object will fall in the domain of (say) 'biochemistry' only in so far as it is a topic for corresponding 'biochemical' questions; and the same type of object will fall within the domains of several different sciences, depending on what questions are raised about it. The behavior of a muscle fibre, for instance, can fall within the domains of biochemistry, electrophysiology, pathology, and thermodynamics, since questions can be asked about it from all four points of view ... (1972, pp. 149)

While the objects of study are an important part of what characterizes a discipline, both Shapere and Toulmin made it clear they are insufficient. To identify the set of objects comprising the domain of a discipline, we need to consider why scientists group them together. Scholars who study science generally split over two approaches to addressing this issue, roughly differentiated by their respective disciplines. Philosophers and historians of ideas adopt what is often characterized as an *internalist* approach to understanding science, emphasizing cognitive factors such as theories and evidence, while sociologists and social historians adopt an *externalist* approach, focusing on social and institutional factors. In the 1970s and 1980s these two approaches were often portrayed as competing and mutually exclusive; more recently, many in science studies have recognized a role for both.

Through most of the twentieth century, philosophers of science focused on the theories advanced by scientists and the relation theories bore to evidence. To the extent that disciplines were considered at all, they were characterized in terms of theories. For example, in discussions of the unity of science – the question of how different sciences related to one another – the logical empiricists identified disciplines with their theories and asked whether they could be related to one another logically. Thus, the question of the relation of biology to physics and chemistry became the question of whether the theories (laws) of biology could, with the aid of bridge principles and boundary conditions, be derived from those of chemistry and physics (Oppenheim & Putnam, 1958; Nagel, 1961). If so, biology was said to be *reduced* to, and thereby unified with, physics.